

- A. $\text{rank}(A) \leq \min\{m, n\}$
- B. Factor $A = P^T L U$ (GEPP)
- C. $\|x^{(1)}\| = \frac{x^{(1)}}{\|x^{(0)}\|}$

උදාහරණය: Eigenvector $A^{-1} = \text{Eigenvector } A$

$\frac{1}{\lambda} = \lambda$

↑ ↑

Eigenvalue Eigenvalue
of A^{-1} of A

Apply **inverse power method** to $\begin{bmatrix} 3 & -1 \\ -1 & 3 \end{bmatrix}$ with $x^{(0)} = [1, 0]^T$

A. ✓, ✓

B. Factor $A = P^T L U$ ដើម្បីស្វែងរក (GEPP)

$$L = \begin{bmatrix} 1 & 0 \\ -1/3 & 1 \end{bmatrix} \quad U = \begin{bmatrix} 3 & -1 \\ 0 & 2/3 \end{bmatrix} \quad P = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\begin{aligned} \text{c. } x^{(0)} &= \frac{x^{(0)}}{\|x^{(0)}\|} \\ &= \frac{\begin{bmatrix} 1 \\ 0 \end{bmatrix}}{1} \\ x^{(0)} &= \begin{bmatrix} 1 \\ 0 \end{bmatrix} \end{aligned}$$

Iteration 0

$$b \leftarrow x^{(0)}$$

$$b = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

Solve $Ly = Pb$ for y

$$\begin{bmatrix} 1 & 0 \\ -\frac{1}{3} & 1 \end{bmatrix} y = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 \\ -\frac{1}{3} & 1 \end{bmatrix} y = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 1 \\ 1/3 \end{bmatrix}$$

Solve $Uz = y$ for z

$$\begin{bmatrix} 3 & -1 \\ 0 & 8/3 \end{bmatrix} z = \begin{bmatrix} 1 \\ 1/3 \end{bmatrix}$$

$$\begin{bmatrix} z_1 \\ z_2 \end{bmatrix} = \begin{bmatrix} 3/8 \\ 1/8 \end{bmatrix}$$

Normalize z as: $\hat{x}^{(k+1)}$

$$\begin{aligned} x^{(k+1)} &\leftarrow \frac{z}{\|z\|_2} \\ &= \frac{\begin{bmatrix} 3/8 \\ 1/8 \end{bmatrix}}{\sqrt{\left(\frac{3}{8}\right)^2 + \left(\frac{1}{8}\right)^2}} \\ x^{(1)} &= \begin{bmatrix} 0.9486 \\ 0.3162 \end{bmatrix} \end{aligned}$$

Iteration 1

$$b \leftarrow x^{(1)}$$

$$b = \begin{bmatrix} 0.9486 \\ 0.3162 \end{bmatrix}$$

Solve $Ly = Pb$ for y

$$\begin{bmatrix} 1 & 0 \\ -\frac{1}{3} & 1 \end{bmatrix} y = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 0.9486 \\ 0.3162 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 \\ -\frac{1}{3} & 1 \end{bmatrix} y = \begin{bmatrix} 0.9486 \\ 0.3162 \end{bmatrix}$$

$$\begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 0.9486 \\ 0.6324 \end{bmatrix}$$

Solve $Uz = y$ for z

$$\begin{bmatrix} 3 & -1 \\ 0 & 8/3 \end{bmatrix} z = \begin{bmatrix} 0.9486 \\ 0.6324 \end{bmatrix}$$

$$\begin{bmatrix} z_1 \\ z_2 \end{bmatrix} = \begin{bmatrix} 0.3953 \\ 0.2372 \end{bmatrix}$$

Normalize z as: $\hat{x}^{(k+1)}$

$$\begin{aligned} x^{(k+1)} &\leftarrow \frac{z}{\|z\|_2} \\ &= \frac{\begin{bmatrix} 0.3953 \\ 0.2372 \end{bmatrix}}{\sqrt{0.3953^2 + 0.2372^2}} \\ x^{(2)} &= \begin{bmatrix} 0.8575 \\ 0.5145 \end{bmatrix} \quad \dots \quad x^{(7)} = \begin{bmatrix} 0.7126 \\ 0.7016 \end{bmatrix} \end{aligned}$$

เก็บค่าลงทะเบียน

Eigenvector A^{-1} = Eigenvector A